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The Effect of Conservation Practices on Crop Yields

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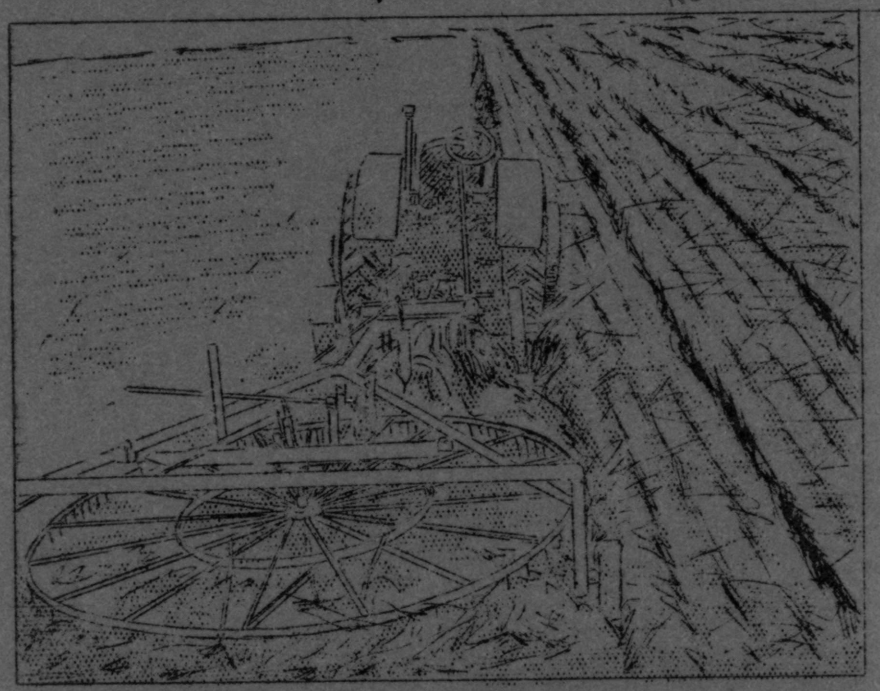

A Method for Leaving Residue on Plowing

Agricultural Experiment Station
South Dakota State College
in cooperation with Research Division of
Soil Conservation Service

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION
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THE EFFECT OF CONSERVATION PRACTICES ON CROP YIELDS

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and South Dakota Experiment Station

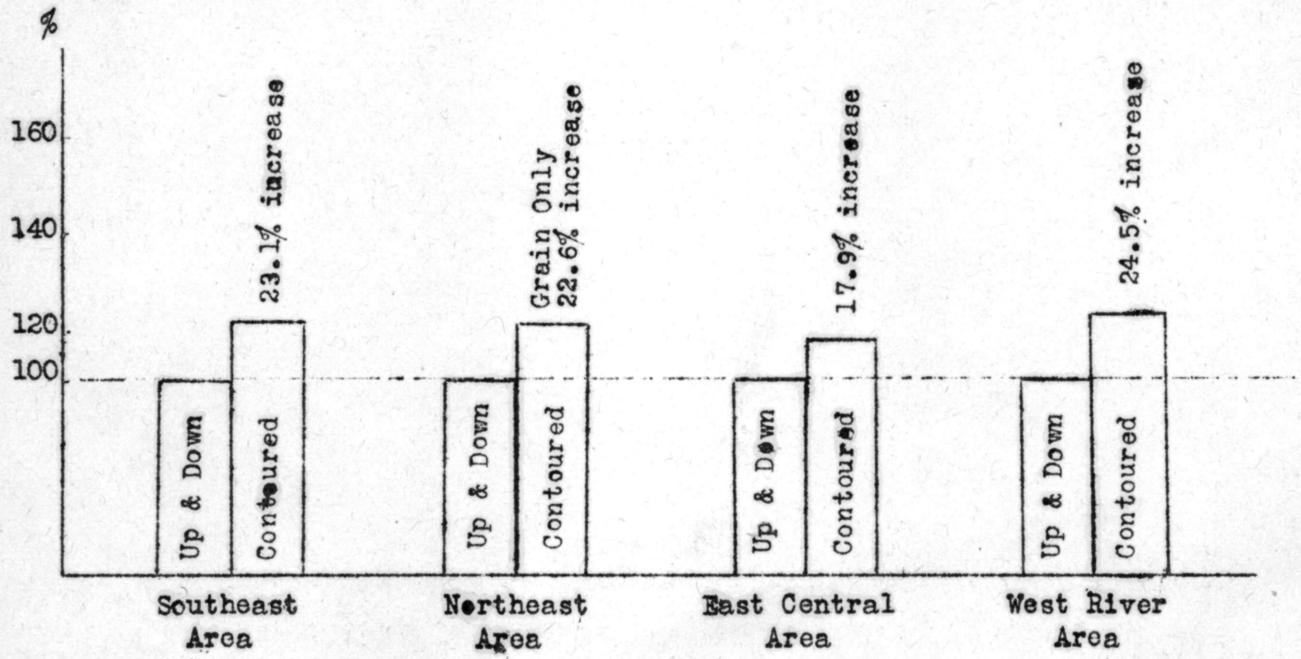
FARMING ON THE CONTOUR

Planting crops on the contour of the land has been one of the most successful conservation practices in South Dakota. The small ridges formed by farming on the level have served to hold the rain and snow water until it has had ample time to penetrate or soak into the soil. This has not only reduced erosion by water, but the additional water saved has resulted in higher crop yields as shown by the following table.

	Southeast Area			Northeast Area
	Corn	Soybeans	Oats	Wheat
Contour	68.6 Bu.	32.9 Bu.	44.0 Bu.	19.0 Bu.
Up and Down	57.5 Bu.	22.9 Bu.	37.8 Bu.	15.5 Bu.

	West River Area			East Central Area	
	Sorghum	Oats & Barley	Wheat	Corn	Oats
Contour	20.2 Bu.	53.0 Bu.	19.9 Bu.	45.0 Bu.	57.6 Bu.
Up and Down	15.8 Bu.	41.5 Bu.	17.5 Bu.	32.5 Bu.	54.5 Bu.

Percentage increase in all crop yields, due to contouring, is shown by areas below:



CROP YIELDS ARE IN PROPORTION TO THE DEPTH OF REMAINING TOPSOIL

In most parts of South Dakota good crops can be produced wherever the major portion of the original topsoil still remains on the land. Wherever a part or all of this topsoil has been removed by erosion, crop yields were lower. It is therefore important that conservation measures be applied before too much topsoil is lost; otherwise high production cannot be maintained.

The following table of crop yields will show crop yields on deep and shallow topsoil.

Southeast part of South Dakota

	Corn	Soybeans	Oats	Barley
Deep Topsoil	66.6 Bu.	26.3 Bu.	44.7 Bu.	30.5 Bu.
Shallow Topsoil	43.1 Bu.	13.2 Bu.	28.6 Bu.	19.1 Bu.

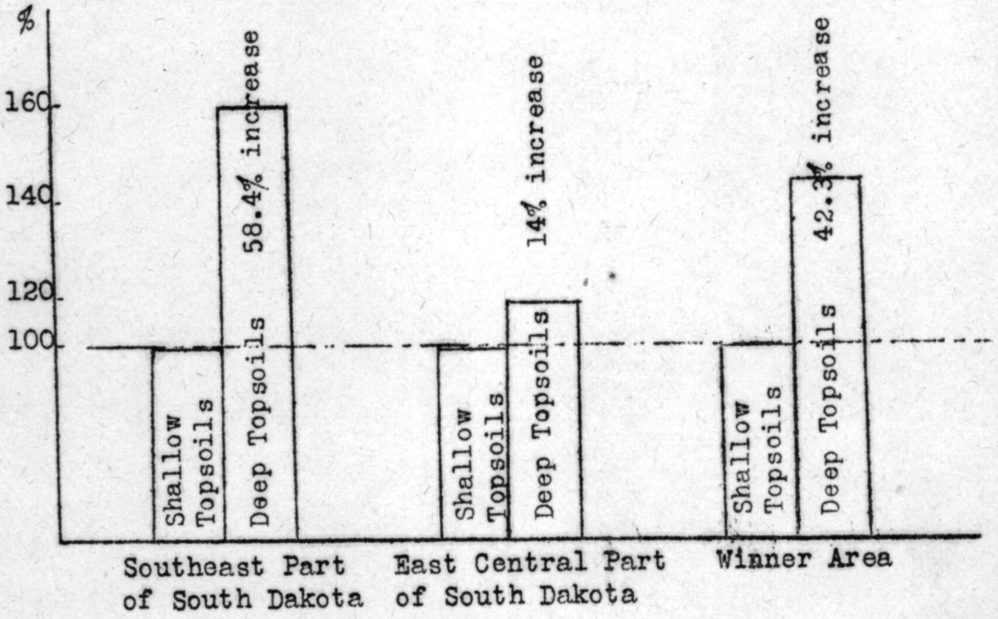
East Central part of South Dakota

	Rye	Barley	Wheat
Deep Topsoil	25.9 Bu.	23.9 Bu.	13.9 Bu.
Shallow Topsoil	21.4 Bu.	23.5 Bu.	11.1 Bu.

Winner Area

	Wheat	Barley
Deep Topsoil	23.7 Bu.	42.9 Bu.
Shallow Topsoil	18.0 Bu.	28.7 Bu.

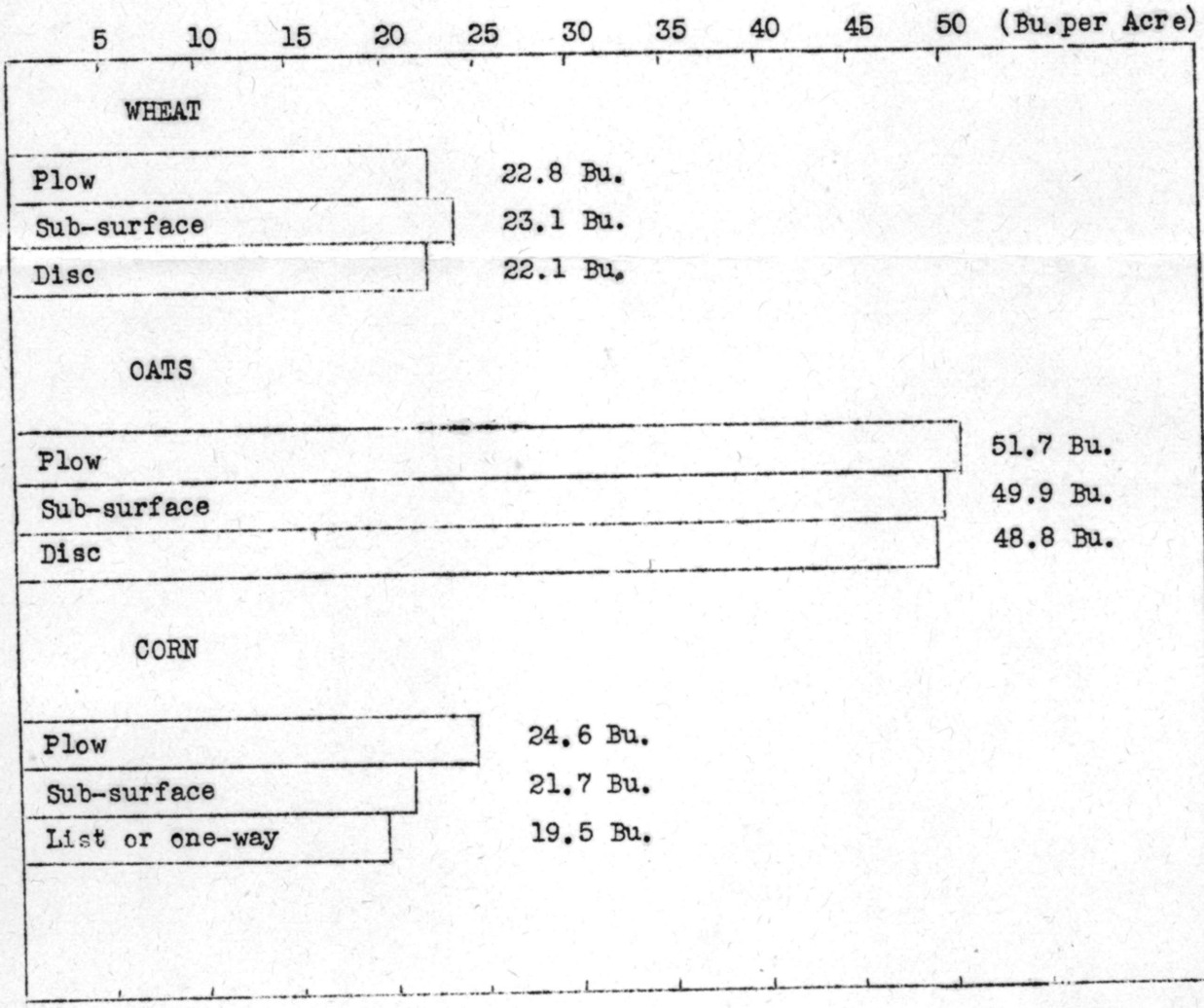
A summary of all crop yields on deep and shallow topsoil is shown by areas on a percentage basis by the following graph:



TILLAGE TRIALS AT HURON, SOUTH DAKOTA, ON THE LEMKE FARM

During the past six years several methods of tillage have been tried on the C. W. Lemke farm near Huron, South Dakota. A three-year rotation of corn-wheat-oats has been used on each tillage method. Each method of tillage has been used continuously on the same plot each year. Type of tillage has made little difference in the yield of wheat and oats. Highest corn yields have been on plowed land. Corn on sub-surfaced land has been very weedy and poor stands of corn have been obtained most of the years on these plots. It appears that sub-surface tillage is a good tillage to use preparing land for small grain crops but a poor one to use in preparation for corn. Plowed fields have been eroded at various times by both wind and water whereas the fields sub-tilled have had the grain stubble for surface protection and have not been eroded.

Crop Yields From the Lemke Farm
(Average of yields 1940-1945)



CROP YIELDS FROM TILLAGE AND RESIDUE TESTS AT HIGHMORE SUBSTATION

Two methods of returning organic matter to the soil have been compared at Highmore. On one set of plots manure was added while on a second set of plots the straw from the small grain crops was returned and on a third set nothing was added. One-half of each plot was plowed and the other one-half surface tilled with a duckfoot so that the crop residues and manure were kept on or near the surface of the soil. This system of tillage and residue treatment was used in three rotations: (1) sorghum-wheat-oats, (2) sorghum-wheat, and (3) summer fallow-wheat.

The effects of tillage and residue treatments were similar in all three rotations. Summer fallow increased wheat yields a little but not enough to compensate for the sorghum crop which would be grown in place of fallow. The wind erosion hazard is also much greater on summer fallowed land. Wheat yields have been higher on land tilled with the duckfoot while oats and sorghum yields were higher on plowed land. Weeds have been more prevalent on sorghum land prepared with the duckfoot than on land prepared by plowing.

Average crop yields produced from 1941 to 1945 by these treatments are shown in the table below:

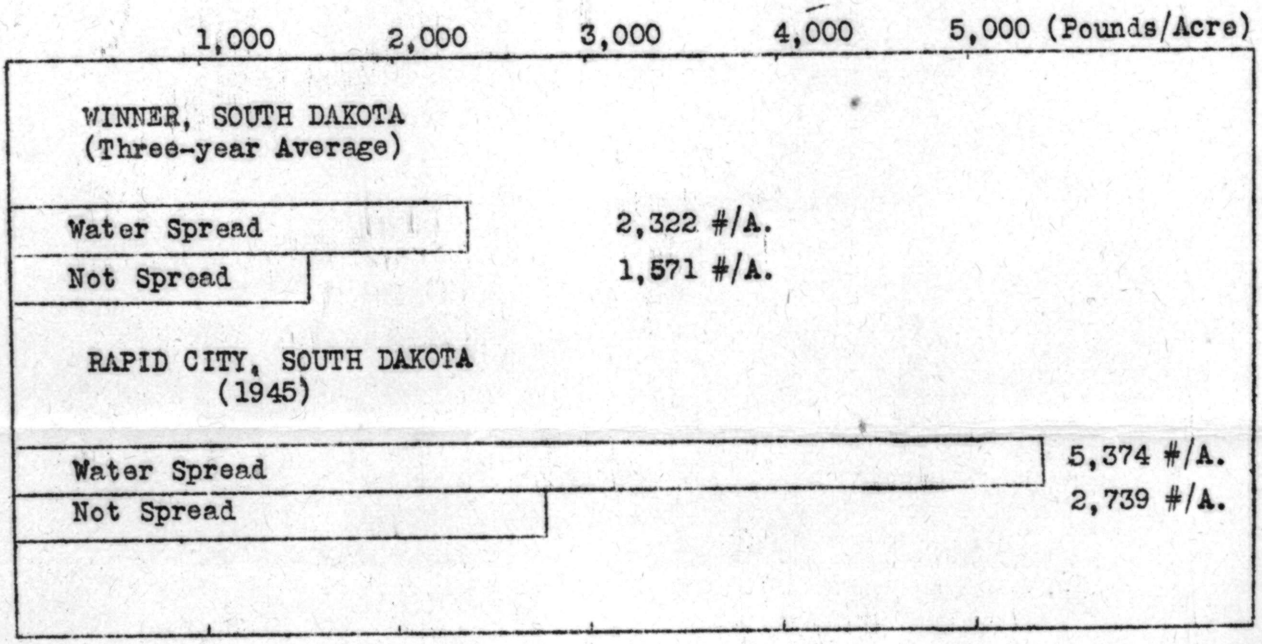
Highmore Tillage and Residue Yields

Crop and Tillage	1941-1945 Ave. on Grain 1943-1945 Ave. on Sorghum		
	Manure	Straw	Check
SORGHUM-WHEAT-OATS ROTATION			
Wheat - - - Plow	22.5	22.4	21.7
Duckfoot	23.9	24.3	23.2
Oats- - - - Plow	57.2	55.5	56.6
Duckfoot	53.4	49.1	52.5
Sorghum - - Plow	5694	5286	5629
Duckfoot	4703	4368	4564
SORGHUM-WHEAT ROTATION			
Wheat - - Duckfoot	20.4	20.5	20.3
Sorghum - Duckfoot	4939	4277	4180
FALLOW-WHEAT ROTATION			
Wheat - - Duckfoot	21.3	22.1	24.8

WATER SPREADING ON GRASSLAND

In the western part of the state rainfall is often inadequate and the slope of the land is such that there is frequently a large amount of run-off from grassland. Water spreading devices are of value in saving this run-off water for increased production of grass.

Tests made at Winner and Rapid City gave the results shown in the graph below:



CONTOUR PASTURE FURROWS

On pastures where the vegetation or grass cover is thin, some mechanical means such as contour pasture furrows may be employed to help hold and spread the water. If a pasture has a good grass cover there is little need for this type of mechanical control. These contour pasture furrows have not only helped hold the soil and water but have also increased the growth of grass.

Several years after the furrows were constructed grass production has been increased an average of 50%. This increase has varied from a low of 30% to more than two and one-half times the yield on the unfurrowed part.

Different size furrows have been tried since 1938 in various parts of South Dakota. Invariably, furrows smaller than those made with a lister or plow have filled in and became ineffective in a few years time. Some of the most effective and highest producing furrows were constructed with a grader.